

EXTRACTING DNA FROM STRAWBERRIES

DNA Extraction



Strawberries

Introduction:

DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms. There are obvious differences between plants and animals, but at the chemical level the cells of all plants and all animals contain double helix DNA, and same four chemical building blocks called Nucleotides. What makes these plants and animals different are how these four nucleotides in DNA are arranged. It is their sequence which determines which proteins are made, and the information they encode decides the fate of the organism whether to produce scales or leaves; legs or a stalk.

To obtain a DNA from a cell, Scientists typically rely on one of many DNA extraction kits available from biotechnology companies. For DNA extraction, detergent is used to lyse the cell so that DNA is released into the solution. Then alcohol is added to cause the DNA to precipitate out. Strawberries are chosen for this particular experiment because strawberry cell has eight copies of the genome, and it would be easier to extract the DNA since it is a lot per cell whereas most of the organisms would only have one genome copy per cell.

Materials:

Rubbing alcohol

Measuring cup

Measuring spoons

Salt

Water

Dishwashing liquid (for hand-washing dishes)

Glass or small bowl

Cheesecloth

Funnel

Tall drinking glass

Three strawberries

Resealable plastic sandwich bag

Small glass jar

Bamboo skewer

Preparation

- Chill the rubbing alcohol in the freezer.
- Mix one half teaspoon of salt, one third cup of water and one tablespoon of dishwashing liquid in a glass or small bowl.
Set the mixture aside. (This is your extraction liquid)

- Completely line the funnel with cheesecloth. Insert the funnel tube into the tall drinking glass (**not** the glass with the extraction liquid in it).
- Remove and discard the green tops from strawberries.

Procedure

- Put the strawberries into a resealable plastic sandwich bag and push out all the extra air. Seal the bag tightly.
- With your fingers, squeeze and smash the strawberries for two minutes.
- Add three tablespoons of the extraction liquid you prepared to the strawberries in the bag. Push out all the extra air and reseal the bag.
- Squeeze the strawberry mixture with your fingers for one minute.
- Pour the strawberry mixture from the bag into the funnel. Let it drip through the cheesecloth and into the tall glass until there is very little liquid left in the funnel (only wet pulp remains).
- Pour the filtered strawberry liquid from the tall glass into the small glass jar so that the jar is one quarter full.
- Measure out one half cup of cold rubbing alcohol.
- Tilt the jar and very slowly pour the alcohol down its side. Pour until the alcohol has formed approximately a one-inch-deep layer on top of the strawberry liquid. You may not need

all of the one half cup of alcohol to form the one-inch layer.
Do not let the strawberry liquid and alcohol mix.

- Study the mixture inside of the jar. The strawberry DNA will appear as gooey clear/white stringy stuff.
- Dip the bamboo skewer into the jar where the strawberry liquid and alcohol layers meet and then pull up the skewer.

Observations and Results

When you added the salt and detergent mixture to the smashed strawberries, the detergent helped lyse the strawberry cells, releasing the DNA into solution, whereas the salt helped create an environment where the different DNA strands could gather and clump, making it easier for you to see them. (When you added the salt and detergent mixture, you probably mostly just saw more bubbles form in the bag because of the detergent.) After you added the cold rubbing alcohol to the filtered strawberry liquid, the alcohol should have precipitated the DNA out of the liquid while the rest of the liquid remained in the solution. You should have seen the white/clear gooey DNA strands in the alcohol layer as well as between the two layers. A single strand of DNA clumped in this activity you were able to see just how much of it three strawberries have when all of their octoploid cells are combined!

Follow up questions:

- What did the DNA look like?
- How small is the DNA and why can we see it now?
- How the DNA was extracted using alcohol?
- What is the structure of DNA and why does it look like a folded thread?

Reference:

NIH, U.S. National Library of Medicine,
<https://ghr.nlm.nih.gov/primer/basics/dna>

Earth sky team: What's the difference between plant DNA and animal DNA?

Retrieved from: <http://earthsky.org/earth/dna-animals-plants#>

Squishy Science: Extract DNA from smashed strawberries. A genetically geared activity from Science buddies. Retrieved from <https://www.scientificamerican.com/article/squishy-science-extract-dna-from-smashed-strawberries/>

Images:



Image references:

Title image:

<https://www.slideshare.net/stratt45/dna-extraction-strawberry-lab-spring-2015>

DNA separating in the test tube:

<http://www.instructables.com/file/FZC6J9ZGYVDICUA/>

Smashed strawberries:

https://mikesbliology.files.wordpress.com/2014/10/img_0331.jpg